# GETTING STARTED

A Guide For New Users

# 5440 Series

DIRECT VOLTAGE CALIBRATORS

FLUKE

# G E T T I N G  S T A R T E D

A Guide For New Users

# 5440 Series

*DIRECT VOLTAGE CALIBRATORS*

FLUKE

# CONTENTS

START WITH THIS GUIDE if this is your first experience with a Fluke 5440 Series Direct Voltage Calibrator. This guide describes the basic functions and uses of the Calibrators and takes you through example calibration procedures.

Enjoy your new 5440 Series Calibrator!


| | |
|---|---|
| 5440 SERIES DIRECT VOLTAGE CALIBRATORS | 3 |
| FRONT PANEL FEATURES | 5 |
| REAR PANEL FEATURES | 6 |
| TURNING ON THE CALIBRATOR | 7 |
| CONNECTING A METER | 9 |
| FRONT PANEL OPERATION | 10 |
| USING THE PROCEDURE STORAGE MODULE (MODEL 5440B ONLY) | 14 |
| REMOTE OPERATION | 19 |
| GENERATING HARD COPY | 22 |
| 5440 SERIES OPERATOR MANUAL | 23 |



P/N 752014
May 1985



©1985 John Fluke Mfg. Co. Inc., All rights reserved. Litho in U.S.A.

# 5440 SERIES DIRECT VOLTAGE CALIBRATORS

**WARNING**

**5440 SERIES DIRECT VOLTAGE CALIBRATORS ARE CAPABLE OF GENERATING LETHAL VOLTAGES. USE CAUTION WHEN OPERATING THEM. DO NOT TOUCH THE OUTPUT TERMINALS WHEN THEY ARE ACTIVE (IN OPERATION MODE).**

**Introduction**

Your Fluke 5440 Series Direct Voltage Calibrator is a programmable calibrator designed for use in production environments and calibration laboratories. Two models are discussed in this guide, the 5440B and the 5442A. The 5440B has slightly higher accuracy, non-volatile procedure storage, and rear panel output terminals. Rear panel output terminals are offered as an option on the Model 5442A.

# 5440 SERIES DIRECT VOLTAGE CALIBRATORS

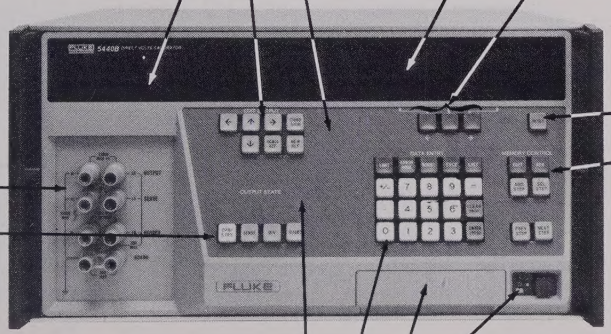
Other features of the Calibrators include:

- Voltage output from 0 to 1100 volts.
- Set reference voltages, limits, current trip point, tolerance floor, and the percentage of reference error.
- Vacuum-fluorescent displays.
- IEEE-488 and RS-232-C interfaces.

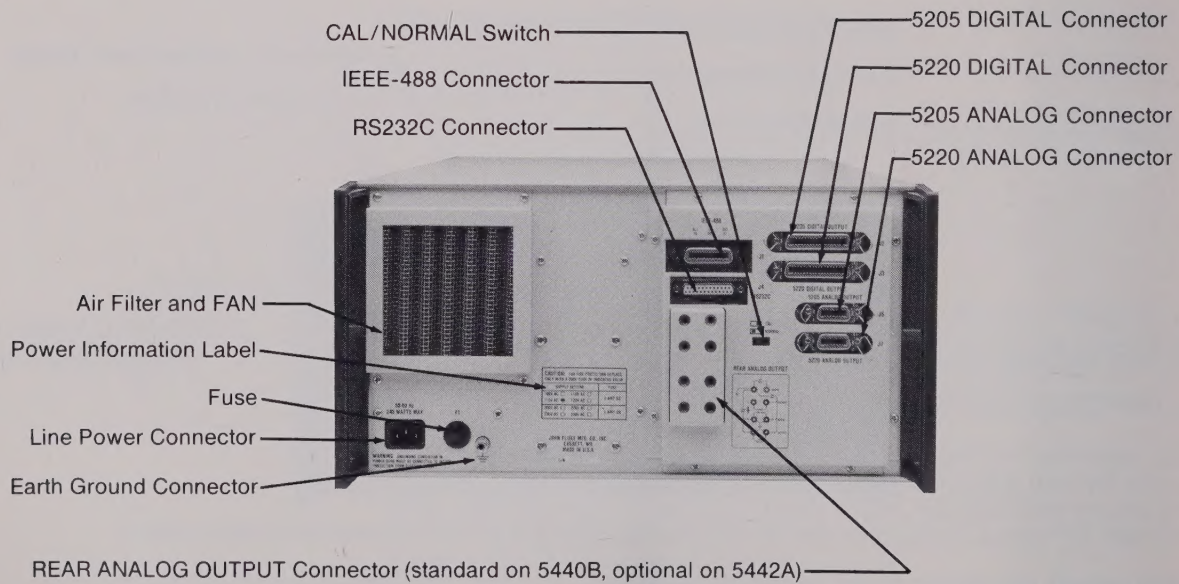
This guide is intended as an introduction to your Calibrator. The guide contains examples of the most commonly used functions so you can become familiar with your Calibrator and quickly begin to see results. This guide is not intended to replace your 5440 Series Direct Voltage Calibrators Operator Manual.

To work through the following exercises, you will need a multimeter, such as the Fluke 8840A, and test leads. For some of the exercises you will also need an instrument controller such as a Fluke 1722A, an IEEE-488 interface cable, a printer that is compatible with the RS-232-C interface, and an RS-232-C interface cable.

# FRONT PANEL FEATURES



# REAR PANEL FEATURES



# TURNING ON THE CALIBRATOR

**Applying Power**

To apply power to the Calibrator, perform the following steps:

1. Connect the power cord to the power connector on the rear panel of the Calibrator, and then to an ac outlet.

2. Set the Calibrator power switch to on.

**Power-On Default Parameters**

The Calibrator is initialized when it is first turned on (or when the RESET key is pressed). All indicators light for a short time, and then the Calibrator programs itself to the power-on default state. The power-on default parameters are shown in the following table.

| PARAMETER | DEFAULT |
|---|---|
| Output Voltage | 0.0 mV |
| Edit Mode Reference | 0.0 mV |
| Voltage Limits | ±1100V dc |
| Current Limit | ±25 mA |
| Error Mode Tolerance | ±(.00000% +00.00 μV) |
| Instrument Status | Standby, Internal Sensing, Divider Off, Internal Guard |

# TURNING ON THE CALIBRATOR

**Warm-Up Time**

Warm-up time is the length of time between when the Calibrator is turned on and when the output is stable enough for precision operation within the instrument specifications. The Calibrator should be warmed up for two hours prior to calibration procedures. If it has been stored at less than 18° C or more than 28° C, up to four hours warm-up time may be required, depending upon the temperature extremes to which it has been exposed. The Calibrator can be left on for long periods of time if that is most convenient.

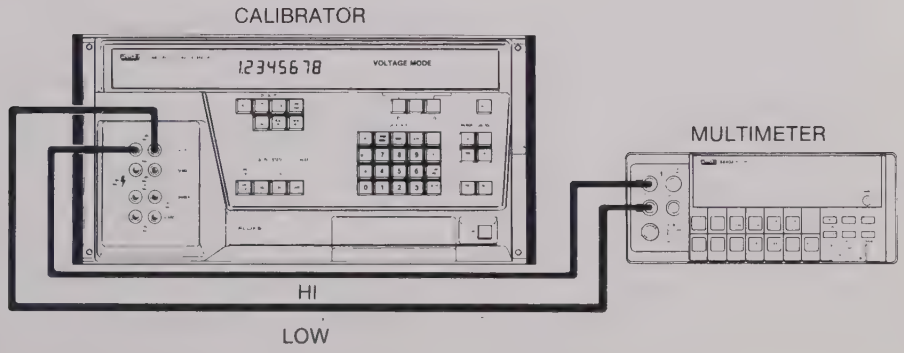
Although the Calibrator may not have reached full stability, it may be used for the examples in this guide one half hour after being turned on.

# CONNECTING A METER

To connect a multimeter to the Calibrator, perform the following steps:

1. Verify that the Calibrator is turned on, has had adequate warm-up time, and is in the standby mode (STBY indicator is lit).

2. Set the multimeter to its highest dc voltage range and connect it to the Calibrator front panel output terminals as shown in the following figure.



# FRONT PANEL OPERATION

**Modes of Operation**

Voltage Mode is the normal stand-alone mode of operation for the Calibrator. (The 5440B also has voltage-boost and current-boost modes.) The output is present at either the OUTPUT or DIVIDER terminals when the Calibrator is in the operate mode (the OPR indicator is lit).

**Data Entry**

The top row of DATA ENTRY keys are used to select the soft-key menus. The remaining three rows are used for entering answers to questions given on the alphanumeric display, and for entering numbers shown on the Calibrator display.

When the Calibrator alphanumeric display asks a question, you must answer before you can proceed. Use the CLEAR (NO) or ENTER (YES) keys to give your answer. When a numerical value is required in an operation, the Calibrator display prompts you with the power-on default parameter or the last value entered, followed by a question mark. If the value displayed is the one you want, press ENTER (YES).

If you would like to enter a different value, you can do that now. When the first DATA ENTRY key is pressed, the alphanumeric display clears and then shows the new entry. If you make a mistake and want to change the value, press CLEAR (NO).

**Voltage Measurement**

To take a voltage measurement, set the multimeter to the lowest range that accepts 10 volts. Perform the following steps to enter the value of 10V.

Press:


**Edit the Output**

After you press ENTER (YES), the alphanumeric display returns to the VOLTAGE MODE, and the value of 10V shows on the Calibrator display. Press the OPR/STBY key to light the OPR indicator. This key sequence connects 10V to the output of the Calibrator front panel terminals. The multimeter now displays 10V.

The EDIT OUTPUT keys let you edit a value after it has been entered. The right- and left-pointing arrow keys highlight the digit you wish to edit (the highlighted digit is brighter than the others on the display). The up-and down-pointing arrow keys respectively increment and decrement the highlighted digit.

Experiment with the arrow keys now, editing the 10V value entered in the previous exercise. Highlight the 0, and use the up-arrow key to change it to a 9. Highlight the 1, and change it to a 0. The new value displayed is 9V.

**Edit Output Keys**

The CHNG SIGN key toggles the output voltage polarity between + and -. The RCALL REF key returns the output voltage to the value originally entered from the DATA ENTRY keys. To recall the last reference value entered, press the RCALL REF key to see the display return to 10.000000V. The NEW REF key takes the value in the output display as the new reference as though it had been entered from the DATA ENTRY keys. Edit the display to read 9.500000V, and press the NEW REF key. Edit the display again to read 9.900000V. Press the RCALL REF key and the display returns to 9.500000V, the value stored by the NEW REF command.

**Using Soft Keys to Calculate an Error**

The three dark-grey soft keys are located on the upper right side of the Calibrator front panel. The soft keys become activated when you first press any of the dark-grey DATA ENTRY or MEMORY CONTROL keys. There are 15 soft-key menus. However, for the purposes of this guide, only three of the soft-key menus are discussed.

ERROR MODE:

1. Press ERROR MODE and the Error menu appears on the alphanumeric display.
2. Press % ERROR ON (the left-hand soft key) and the error of your multimeter from the nominal value (the 9.5 volts entered in the previous example) is displayed. Edit the output voltage until the meter reads exactly 9.5 volts. Note the % error reading.
3. Press ERROR MODE and % ERROR OFF to clear the Error Mode.

LIMITS:

1. Press the LIMIT key, then press the VOLT LIMITS key (the left-hand soft key of the Limit menu). The DEFAULT VOLTAGE LIMITS request now appears on the display. Use the DATA ENTRY keys to enter the desired positive voltage limit.
2. Press the center soft key to toggle between the positive and negative limit entries. Use the DATA ENTRY keys to enter the negative limit entry value. Press the ENTER (YES) key.

SERVICE:

1. Using the soft keys, select the SVCE, SELF TEST, and the DIGITAL TEST functions.
2. Press the SVCE key. Using the soft keys, select the SELF TEST, and the ANALOG SELF TEST functions.
3. The Calibrator prompts you to remove any test leads. When you press the ENTER (YES) key, the test begins the analog self test. The procedure takes several minutes.

During the test, the display is updated to inform you of its progress. When the analog self test is complete, the Calibrator returns to the VOLTAGE MODE and standby state.

# USING THE PROCEDURE STORAGE MODULE (MODEL 5440B ONLY)

The Procedure Storage Module feature of the 5440B Calibrator lets you select, modify, and store sequences of front panel calibration setups. Each front panel removable module can hold up to 60 steps, and each step can contain up to eight types of setup data for the 5440B. The setup parameters are shown in the following list:

1. Operating mode: voltage, voltage boost, or current boost.
2. Output state: operate or standby, internal or external sense, divider on or off, internal or external guard.
3. Error mode display information.
4. Output value.
5. Cursor location on the display.
6. Voltage limits.
7. Current limits.
8. Tolerance specifications for output edit (when applicable).

# USING THE PROCEDURE STORAGE MODULE (MODEL 5440B ONLY)

A setup is first keyed into the 5440B's memory. When a sequence is complete, it is transferred to a Procedure Storage Module. In reverse, prepared sequences stored in a module can be transferred to the 5440B's memory. Instructions for using the Procedure Storage Module are as follows:

**Memory Control Keys**

There are six memory control keys. Their functions are as follows:

1. EDIT

   The EDIT key calls up the Edit soft-key menu. Here are the choices you can make using the Edit soft-key menu:

   a. INSERT STEP sets the current front panel setting before a designated step. Use the DATA ENTRY keys to enter the number of the designated step.

   b. REPLACE STEP sets the front panel setting in memory in place of a designated step. Use the DATA ENTRY keys to enter the number of the designated step.

   c. DELETE STEP removes the currently displayed step number from the memory. When the delete step soft key is selected, the 5440B reads:

      DELETE STEP 0 FROM
      SEQUENCE IN MEMORY?

      Change the step number using the data entry keys.

2. ADD STEP

   The ADD STEP key adds the present 5440B front panel setup to the 5440B's memory as the step number shown in the upper right of the alphanumeric display.

3. PREV STEP

   The PREV STEP key recalls the front panel setup stored at the memory location that is one step before the step shown on the alphanumeric display.

4. XFER

   The XFER key calls up the Transfer soft-key menu. Here are the choices you can make using the Transfer soft-key menu:

   a. MODULE TO MEM is used to transfer the contents of a memory module to the Calibrator memory. This is used when you have a procedure already stored in a module. The only entry required is ENTER (YES) (or CLEAR (NO) if you decide you do not wish to store the contents).

b. MEM TO MODULE is used when you have entered the procedure into the 5440B memory and are ready to save it in a memory module. Press ENTER (YES) or CLEAR (NO).

c. CLEAR MEMORY removes all stored settings from the Calibrator's memory. The Calibrator first asks if you are sure you want to clear the Calibrator's memory. Press ENTER (YES) if you want to clear the memory.

5. SEL STEP

The SEL STEP key is used to recall the front panel setup stored using a particular step number. First use the SEL STEP key, and then use the DATA ENTRY keys to enter the number of the step.

6. NEXT STEP

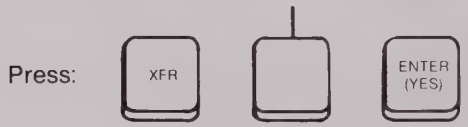
The NEXT STEP key recalls the front panel setup stored at the memory location one step greater than that which is displayed.

# USING THE PROCEDURE STORAGE MODULE (MODEL 5440B ONLY)

**Preparing a Module**

Set up the front panel for the first step, and press ADD STEP to store the setting in the 5440B's memory. Repeat the process for all subsequent steps.

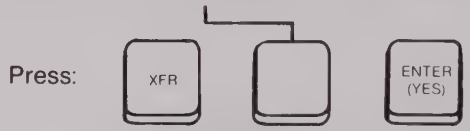
When all the steps are stored in the 5440B memory, transfer the 5440B memory to a Procedure Storage Module. Perform the following key sequence:




(middle soft key)

**Using a Prepared Module**

First insert the Procedure Storage Module into its slot on the Calibrator's front panel and perform the following key sequence:




(Left-hand soft key)

Advance through the steps using the NEXT STEP key.

# REMOTE OPERATION

The Calibrators are designed in accordance with the IEEE-488 Standard 488-1978 for use in a system configuration with any IEEE-488 controller, such as the Fluke 1722A Instrument Controller. All front panel functions can be duplicated in remote control (except for the Power switch and functions using the Procedure Storage Module feature of the 5440B).

**Connecting to the IEEE-488 Interface**

To set up the Calibrator to operate in remote control, perform the following steps:

1. Be sure the Calibrator is turned on.
2. Connect the IEEE-488 cable to the Calibrator and to the 1722A IEEE-488 interface connectors.
3. Connect the 1722A to an ac outlet.

4. Turn on the 1722A with a system disk in place, and select BASIC. If you need more information, refer to the 1722A Getting Started Guide or the 1722A Programming Manual.

5. Set the Calibrator address to 7 (the system default address) using the service soft-key menu, as follows:

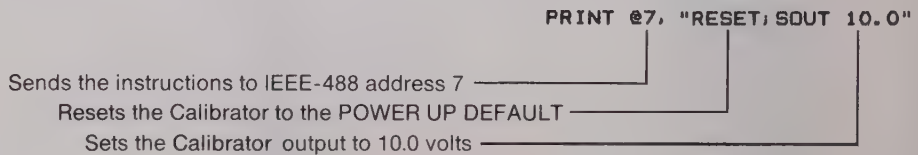
   a. Press SVCE to call up the service menu.

   b. Use the right-hand soft key to select PORT SVCE.

   c. Use the left-hand soft key to select IEEE ADDR. The current IEEE-488 address is displayed. Use the DATA ENTRY keys to enter the correct address.

**Typical Calibrator Control Statement**

Here is a typical control statement as it might appear in a 1722A Instrument Controller BASIC program:


PRINT @7; "RESET; SOUT 10.0"
Sends the instructions to IEEE-488 address 7
Resets the Calibrator to the POWER UP DEFAULT
Sets the Calibrator output to 10.0 volts

**Programming Example**

The following program was written in Fluke BASIC for use with a 1722A Instrument Controller.

```
10 ! THIS PROGRAM SETS THE CALIBRATOR OUTPUT
20 ! TO 10.0 VOLTS, OPERATE, THEN CHECKS THE
30 ! STATUS OF THE CALIBRATOR
40 ! PRINT @7, "RESET"
50 ! PRINT @7, SOUT 10.0"
60 ! PRINT @7, "OPER"
70 ! PRINT @7, "GSTS"
80 ! INPUT @7, A$
90 ! PRINT A$
100 STOP
```

For programming instructions, including a complete list of commands, refer to Section 4 of the 5440 Series Direct Voltage Calibrators Operator Manual.

**Other Controllers**

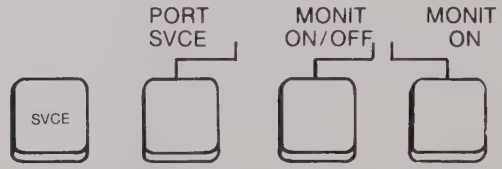
Every controller handles IEEE-488 commands somewhat differently. If you are using a controller other than the Fluke 1722A, refer to your controller's programming manual for instructions.

# GENERATING HARD COPY

With the RS-232-C serial interface, you can generate hard copy on a serial printer. The Calibrator generates five types of printouts:

1. Calibration constant listing
2. Sequence listing
3. Results listing
4. Internal calibration monitor listing
5. Analog diagnostics monitor listing

Hard copy of the first three items is generated in local control with the LIST menu. Hard copy of the last two items is generated automatically when the monitor function is turned on. To turn the monitor function on, perform the following key sequence:




For hard copy, connect a Fluke Model 1776A Printer (or other compatible RS-232-C printer) to the RS-232-C port. For a visual display, connect a Fluke Model 1780A display terminal to the RS-232-C port.

# 5440 SERIES OPERATOR MANUAL

When you have finished the exercises in this guide, you may still have questions about the operation of the 5440 Series Calibrators. If calibration is new to you, review the tutorial and reference material in the 5440 Series Direct Voltage Calibrators Operator Manual to learn how to use the Calibrator correctly. If you have calibration experience, look through the Operator Manual to familiarize yourself with the instrument.

If you are evaluating the Calibrator, the Operator Manual provides complete specification information. With the assistance of your Fluke Sales Engineer or Representative, this information will help you determine if a 5400 Series Direct Voltage Calibrator is appropriate for your application. Also ask your Sales Engineer about options, systems, and special configurations to tailor a calibration system to your specific needs.

www.manualsplus.com
1029511